population. The next return is scarlet fever, 2·98 per 1000. This takes no account of the difference in mortality or disability entailed by these two diseases, and if allowed for would greatly raise the former.

The committee is to be congratulated upon an earnest attempt to deal constructively with a complex question. Its tendency throughout to ignore the medical department of the Local Government Board will doubtless be rectified later in the interests of unified public health administration.

NOTES.

THE Secretary of State for the Colonies has appointed a Commission to study the nature and the relative frequency of the fevers occurring amongst the Europeans, natives, and others in West Africa, especially with regard to yellow fever and its minor manifestations. The members of the Commission are:—Sir James K. Fowler, K.C.V.O. (chairman), Major Sir Ronald Ross, K.C.B., F.R.S., Colonel Sir William Leishman, F.R.S., Prof. W. J. R. Simpson, C.M.G. Mr. A. Fiddian, of the Colonial Office, has been appointed secretary to the Commission, and Mr. T. F. G. Mayer assistant secretary. In the absence of special reasons, the members of the Commission will not themselves proceed to West Africa, but local investigators will work under their direction at certain centres. As at present arranged, those centres will be Freetown in Sierra Leone and Sekondi and Accra on the Gold Coast. The investigation will be set on foot towards the end of April or early in May. Endeavours have been made to enlist the cooperation of all medical men practising in the British dependencies in West Africa, whether as Government medical officers or otherwise. The funds for this investigation will be provided by the West African dependencies.

M. JULES DE PAYER has furnished the Paris correspondent of *The Pall Mall Gazette* with particulars of his projected arctic expedition, which is intended to leave France in the summer. With the support of the Government and various societies, he will follow his father, the distinguished explorer, in making for Franz Josef Land. One of his objects is to locate the margin of the polar basin to the north-east of that archipelago, an investigation which, if successfully carried out, will provide data for an estimate of the relative areas of the basin and the continental shelf in that quarter of the arctic region. A scientific staff will accompany M. de Payer, with equipment for the prosecution of research in all the various departments which have become associated with polar work; among them the investigation of the upper atmosphere by means of kites is specially indicated. The party will be provided for a sojourn of one year or longer in the north, its ship returning in the meantime. It is to be provided with two aëroplanes, the utility of which as instruments in polar research will be observed with interest: a visit to the pole itself is mentioned as a possibility, but does not appear as a prime object of the expedition. Wireless telegraphy will be installed at the headquarters.

ALL who had the pleasure of the acquaintance of Mr. Carl Hagenbeck—whose death occurred at Hamburg on April 15—could not fail to recognise the indomitable will and dogged perseverance of the man, coupled as they were with a manner of unusual gentleness and kindliness. It was no doubt owing to this unusual combination that Hagenbeck was so signally successful in his trade, for by the former traits he carried out in the most thorough manner every venture upon which he embarked, while by the latter he attracted and tamed his captives in a manner peculiarly his own. Born in a suburb of Hamburg in 1844, young Hagenbeck early acquired an interest in animals from his father, and eventually succeeded in securing the greater portion of the world's trade in wild beasts. In fact, if an animal was wanted you had but to tell Hagenbeck, and, unless war or other political obstacles barred the way, it was practically sure to come. But Hagenbeck's fame was largely based on his novel ideas with regard to the treatment of wild animals in confinement, more especially in the matter of an outdoor life for tropical species in Europe, and in the abolition of visible walls and bars, so that spectators might behold the captives in a state of comparative freedom. These ideas were embodied in the animal park at Stellingen. In 1899 Hagenbeck published, under the title "Von Tieren und Menschen," an account of his life and experiences, an abbreviated English translation of which appeared during the same year.

THE South Metropolitan Gas Company has appointed Mr. J. S. G. Thomas as research physicist to undertake investigations for technical purposes.

THE death is announced, at fifty-two years of age, of Prof. A. C. Elliott, professor of engineering at the University College of South Wales and Monmouthshire, and president of the Institution of Locomotive Engineers.

MR. A. R. HINKS, F.R.S., chief assistant at the Cambridge University Observatory, has been appointed Gresham professor of astronomy, London, in succession to the late Mr. S. A. Saunder.

PROF. L. J. Landouzy, dean of the Paris faculty of medicine, and known by his researches in connection with nervous diseases and tuberculosis, has been elected a member of the Paris Academy of Sciences, in succession to the late M. Teisserenc de Bort.

ON Thursday last, April 17, Mr. G. Hamel, accompanied by a passenger, accomplished a non-stop flight on a two-seater Blériot monoplane from Dover to Cologne, the direct distance being nearly 250 miles, in about four hours and a quarter.

AT the ordinary scientific meeting of the Chemical Society, held on Thursday, April 17, the president, Prof. W. H. Perkin, F.R.S., announced that an extra meeting will be held in the rooms of the society on Thursday, May 22, at 8.30 p.m., when a lecture in honour of the memory of the late Prof. Jacobus Henricus van't Hoff, honorary and foreign member, will be delivered by Prof. James Walker, F.R.S., of Edinburgh.

A FURTHER valuable gift has just been made to the Hull Municipal Museums Committee by Mr. C. Pickering, the donor of the new Museum of Fisheries and Shipping at the Pickering Park. It was recently represented to him that the new museum was already crowded with exhibits, and he has kindly presented a strip of land stretching from the Hessle Road to the Pickering Park, and adjoining the present museum, for the purpose of extension.

ON Tuesday next, April 29, Prof. W. Stirling will begin a course of three lectures at the Royal Institution on recent physiological inquiries. Owing to the illness of Prof. Bateson, his course of lectures on the heredity of sex and some cognate problems has been postponed. In addition to the Friday evening arrangements already announced, discourses will probably be given by Mr. F. Balfour Browne, Capt. C. G. Rawling, Prof. Silvanus P. Thompson, Mr. Owen Seaman, and Dr. Francis Ward.

UNDER its curator, Mr. A. G. Thacker, the Public Museum at Gloucester is being actively developed. The fine collection of Roman remains is being extended and rearranged. In the archæological department the museum has received from Sir W. T. Thiselton-Dyer a collection of the "river-drift" type of palæoliths. The Cotswold district abounds in Neolithic implements, which are here well represented. But in this latter department, by the gift of the fine collection made by the late Mr. G. B. Witts, the museum at Cheltenham holds, perhaps, a higher place. Between the two the Neolithic culture of the southern midlands is now admirably represented.

IN the transmission of pathogenic trypanosomes of man and domestic animals by tsetse-flies in Africa there has been some difference of opinion amongst investigators as regards the connection between the infectivity of the fly and the invasion of its salivary glands by the trypanosomes. Kleine was of opinion that the development of *Trypanosoma gambiense* in *Glossina palpalis* was limited to the intestine of the fly, while the Royal Society's commissioners in Uganda considered that the invasion of the salivary glands was necessary to render the fly infective. In a memoir published in *Annals of Tropical Medicine and Parasitology* (vol. vi., No. 4), Kinghorn, Yorke, and Lloyd publish a number of experiments on the transmission of *T. rhodesiense* by *G. morsitans*, which prove in the most convincing manner that the fly only becomes infective when its salivary glands are invaded and is non-infective when the trypanosomes are confined to the intestine only, even if swarming in this part. The trypanosomes found in the salivary gland resemble the stumpy form found in mammalian blood, and differ from the predominant type found in the intestine of the fly. The same result has been obtained by Miss Muriel Robertson in her researches on the development of *T. gambiense* in *G. palpalis* (Phil. Trans. (B), vol. cciii.).

THE fresh-water fishes of South Africa form the subject of an illustrated report by Messrs. Gilchrist and Wardlaw Thompson, published as part 5 of vol. xi. of the Annals of the South African Museum. It is based on collections in the South African, Bulawayo, and Transvaal Museums, a large proportion of which was procured by the aid of grants from the British and the South African Associations for the Advancement of Science. A considerable number of species are described as new.

ACCORDING to the report for the past year, the Rugby School Natural History Society continues its activity in all branches, the entomological section being particularly remarkable for its energy, as exemplified by a long list of the species of four orders of insects collected in the neighbourhood. We have also received the seventy-ninth report of the Bootham School Natural History, Literary, and Polytechnic Society, in which it is recorded that two of the members obtained prizes at a public-school essay competition arranged by the Royal Society for the Protection of Birds.

MR. G. FISCHER, Jena, has sent us a reprint from the "Handwörterbuch der Naturwissenschaften," entitled "Leitfaden der Descendenztheorie," by Prof. L. Plate, of Jena (price 1.60 marks). The author attempts in fifty-five pages, of which nearly half the space is occupied by illustrations, to sketch the outlines of the evidence on which the evolution theory is based. When the difficulties of compressing the subject to this extent are remembered, the result must be regarded as remarkably successful. All the chief lines of argument are mentioned, with the exception of those derived from the study of heredity and experimental morphology, which are dealt with in a separate section of the *Handwörterbuch*. The style is simple, and the cases chosen in illustration well suited to the purpose, but it is perhaps unfortunate that scarcely any examples are taken from the vegetable kingdom.

IN the report of the American Museum of Natural History for 1912 attention is directed to the policy of instituting exploring and collecting expeditions, rather than depending on purchase, as the chief means of increasing the collections. "While specimens for exhibition are the chief aim of the explorer, he brings back a large amount of information regarding the country visited, as well as photographs, drawings, or paintings, which are absolutely essential both for publication and as accessories to exhibition. . . . In all, thirty-five parties were operating in the field during the year 1912; every continent on the globe except Australia has been visited, and remarkable success has crowned the efforts of the leaders." Illustions of several of the new exhibits, including one of a fine pair of African forest-hogs, render the report highly attractive.

THE report of the Dove Marine Laboratory, Cullercoats, for the year ending June 30, 1912, deals with a considerable number of subjects bearing more or less directly on practical fishery questions. In most cases these are dealt with very briefly, and it might perhaps be suggested that conclusions of more permanent value would be reached if fewer subjects were investigated, and those that were attempted were more thoroughly and exhaustively done. The paper by B. Storrow on *Nephrops norvegicus* is the most satisfactory from this point of view, and is based on a somewhat extensive collection of valuable data. The note on the spawning of the plaice by the same author, on the other hand, with its accompanying plate, seems to be of only trifling value, and might well have been allowed to rest in the laboratory notebook until further and more conclusive observations could be added. Prof. Meek contributes short papers on lobster culture, on mussel culture, and on the protection of crabs and lobsters, and measurements of certain samples of herrings are also recorded.

IN the current number of *The Quarterly Journal of Microscopical Science* (vol. lviii., part 4) Mr. G. E. Johnson gives an account of those familiar yet little-known organisms, the nematodes of the common earthworm. Larval nematodes occur abundantly, both encysted in the body-cavity and in an active condition in the nephridia. These are shown to belong to the same species, which the author distinguishes as "*Rhabditis pellio*, Bütschli, non Schneider." As Schneider's species was described first it is obvious, as the author points out, that a new specific name will be required for the form under discussion, but he refrains from giving this name until Schneider's species shall have been re-examined. Apparently the nematodes do no harm to the earthworm, and they only reach the adult condition in the decaying body of the worm after the latter has died. There is no evidence of another host, but the complete life-history is not yet known. Another paper of interest from the point of view of economic zoology is by Mr. J. Davidson, being the first part of an elaborate memoir on the structure and biology of the woolly aphis of the apple-tree, often known as the American blight. Captain Meek contributes a useful discussion on the mechanism of mitosis, from which it appears very evident that, in spite of numerous theories, no satisfactory explanation of the phenomena has yet been arrived at. The only general conclusion that can be drawn at present appears to be "that the mitotic spindle is not a figure formed entirely by the action of forces at its poles."

THE April number of *Bedrock* (vol. ii., No. 1) offers a varied and interesting bill of fare to its readers, ranging from a study of Japanese colonial methods, by Miss Ellen Churchill Semple, to Prof. H. H. Turner's essay on the nebular hypothesis and its developments. Miss Semple's article affords an interesting glimpse of the up-to-date application of scientific principles to colonisation as practised by the Japanese. In the island of Formosa the savage aborigines are isolated by means of a wire fence 300 miles long, the lowest wire of which is charged with an electric current strong enough to stun or kill anyone trying to climb over or creep under it. The fence is guarded at intervals of 500 yards by block-houses with armed police, one of whose functions is to receive the natives within the pale of civilisation when they are prepared to submit, and thenceforth to educate and look after them generally. Prof. Poulton contributes a very useful account of the latest advances in our knowledge of the phenomena of mimicry, as illustrated by the African Papilioninæ. It will be remembered that the polymorphic females of certain species of this group of butterflies are adapted to mimic various species of Danainæ and Acræinæ in different parts of the continent, and that one and the same female may produce several different forms of mimicking offspring. Prof. Poulton dismisses the suggestion that the different forms of mimicking pattern have arisen by sudden mutation, and brings forward evidence to show that they have been produced gradually by natural selection. At the same time he adduces evidence which suggests that the different patterns may be inherited in Mendelian fashion. The discussion on telepathy as a fact of experience is continued by Sir Oliver Lodge and Sir Ray Lankester, and Mr. McDougall has a very interesting article on modern materialism, in which he discusses the question of Vitalism *versus* Mechanism. Considerations of space prevent us from mentioning other valuable contributions.

REPRINTS have been received of two interesting papers dealing with the evolutionary aspects of plant ecology, one by Rev. G. Henslow ("Evolution considered as Bearing upon the Evolution of Plants," *Scientia*, vol. xiii., 1913, 19 pp.), and the other by Mr. L. Cockayne, F.R.S. ("Observations Concerning Evolution Derived from Ecological Studies in New Zealand," Trans. N.Z. Inst., vol. xliv., 1912, 50 pp., 8 plates). The latter is of especial importance from the wealth of observational data which it contains, throwing light upon various problems in the ecology and biology of plants in general, and suggesting many others which are open for investigation. It is not possible here to analyse these publications, which will doubtless receive attention in the newly founded *Journal of Ecology*. It must suffice to say that both authors urge that students of evolution have not paid sufficient attention to the material drawn from the ecological study of vegetation, and that many facts concerning the relation of plants to environment can only be adequately explained on the assumption that characters evoked by stimuli affecting the body-cells are emphatically capable of being inherited.

LADY ISABEL BROWNE has sent a reprint of "Contributions to our Knowledge of the Anatomy of the Cone and Fertile Stem of Equisetum" (*Annals of Botany*, vol. xxvi.), from which it appears—as so frequently happens—that the re-investigation of the structure of even the most familiar plants, especially those belonging to groups which had a much greater development in the past than at the present day, results in the filling-up of various gaps in the knowledge of these groups. The author gives an historical introduction indicating previous work done on this much-investigated genus, and after presenting the results of her own thorough examination of the anatomy of the cone and fertile stem of several horsetail species, discusses the general organisation of the cones in the recent and extinct Equisetales. The structure of the cone axis or stem supports the view that the spore-bearing organs (sporangiophores) are whole appendages and not lobes of a sporophyll or leaf. The collar-like outgrowth (annulus) below the cone in recent horsetails appears to represent a reduced node;

this is confirmed by the anatomy of abnormal specimens of the field horsetail in which more than one annulus is present.

The report of experiments carried out in 1912 at the Harper Adams Agricultural College and in Shropshire and Staffordshire contains accounts of inquiries into the effect of pruning and of grass on fruit trees, the wart disease of potatoes, the manuring of grass land for milk, &c. During the past year oats in many parts of the country were badly attacked by the frit-fly (*Oscinis frit*), and since the life-history of this pest is not fully known, investigations in this direction have been instituted. Although preventive measures cannot be given at present, it may be noted that early sown crops are not so liable to attack as those sown later, and also that a dressing of nitrate of soda helps the plant to recover from initial attack by the pest. How far the severity of attack depends on the variety of oat has still to be ascertained, but striking differences were observed among the varieties cultivated last year.

Messrs. E. S. Salmon and C. W. B. Wright contribute a paper to the March number of the Journal of the Board of Agriculture on lime-sulphur wash for American gooseberry mildew. As a result of extended observations it has been found that different varieties of gooseberries differ to a marked degree as regards the susceptibility of the foliage to injury from the wash. It is possible with some varieties, *e.g.* "May Duke," to spray repeatedly throughout the season with lime-sulphur, at a strength (1·01 sp. gr.) sufficient to prevent the attacks of the mildew, without causing any injury to the foliage. In other cases it seems probable that the foliage of a variety may be resistant to injury from the wash, while showing susceptibility later in the season. Other varieties, such as "Valentine's Seedling" and "Yellow Rough," are so sensitive that they cannot safely be sprayed with lime-sulphur.

The report of Stonyhurst College Observatory (Lancashire) for 1912 contains results of meteorological, magnetical, and seismological observations, together with mean and extreme values for the last sixty-five years. Some of the meteorological results for last year are noteworthy from several points of view. The annual rainfall was 7¼ in. above the average; in March the amount was more than double the average, and was the greatest on record for that month. The duration of bright sunshine was nearly 410 hours below the yearly average (thirty-two years); August had only 50 per cent. of the normal amount, and the maximum temperature was 11·6° below its average highest reading. Father Sidgreaves states that owing to the decision of the Meteorological Office to reduce the number of its observing stations the connection of Stonyhurst with the office would cease at the end of March, but we are glad to learn that the automatic recorders are to remain there, and will be kept in active service. This observatory is one of those adopted by the first Meteorological Committee (1867) for the continuous registration of meteorological phenomena at important positions in the British Islands. In the report of the Meteorological Committee for the year ended March 31, 1912, it was explained that the urgency of questions connected with the upper air had decided it to withdraw in some cases the grants made for the continuance of observations in the old form.

Part 5 of the first volume of the science reports of the Tohoku Imperial University, Japan, contains a paper on the magnetic susceptibilities of iron, steel, nickel, and cobalt up to temperatures of 1300° C., by Profs. Honda and Takagi. The method used depends on the measurement of the force under which the magnetisable material moves from a weak to a strong part of the magnetic field in which it is placed. The field was provided by a small du Bois electromagnet, and the force was measured by means of a delicate spring balance. The materials tested were placed in a small magnesia capsule surrounded by an electric furnace. The temperature of the specimen was determined by means of a platinum platinum-rhodium thermo-junction standardised by the use of the melting points of lead, zinc, antimony, copper, and nickel. As the result of their investigations, the authors find that Curie's law, according to which the susceptibility should vary inversely as the absolute temperature, does not hold for nickel below 500° C., does not hold over any extended range of temperature for cobalt, and is not even approximately true of iron or steel in what is known as the γ state above 800° or 900° C.

Messrs. Townson and Mercer, Ltd., have sent us a specimen of a new type of inorganic filter for laboratory purposes. The filter is cone-shaped, and is understood to be composed of powdered alundum (a variety of fused alumina) cemented by firing with siliceous material. It is sufficiently porous to allow of rapid filtration, is not sensibly affected by solutions of common chemical reagents, and withstands the usual temperatures employed in the laboratory. For use, it is fitted into an ordinary glass funnel by means of rubber tubing, and connected with a filter-pump. Paper filters can be employed with it, or not, according to requirements. One of the chief advantages is that the filter can be used for quantitative determinations in the same manner as a Gooch type of filter, but without the trouble of preparing an asbestos layer every time. A light aluminium stand is supplied for convenience in weighing. How far any difficulty of cleansing or liability to fracture might prove troublesome, only extended trial could show; but a few summary experiments indicate that the filters will probably be very convenient for many gravimetric chemical operations. The makers are the Norton Company, Massachusetts.

In the course of an article on the relation of engineering and architecture, *The Builder* for April 11 suggests two main considerations as accounting for the division which now exists: one, the public willingness to accept great works of engineering as necessary evils from an æsthetic point of view; the other, the greater extent to which the engineer must be immersed in the practical considerations of high mathematical problems which have to be solved in connection with many engineering works. The latter, it is asserted, tends to the narrowing of the mental point of view. The remedies suggested are the education of public opinion so that it will demand the æsthetic treatment of engineering work, and the unification of engineering and architecture as component parts of one calling. Our contemporary considers that the engineer should have a preliminary training in architecture, and that the architect would be the better artist if he had studied something of the principles which underlie engineering, instead of going through the world content to hoe his own furrow irrespective of the general field.

Engineering for April 18 contains a very full illustrated description of the new Cunard liner *Aquitania,* which is being built and engined by Messrs. John Brown and Co., Ltd., of Clydebank. This vessel is the largest ship yet built for the express service to New York. The following are the principal dimensions:—Length over all, 902 ft.; breadth, 97 ft.; depth, 64 ft.; displacement, 49,400 tons; shaft-horse-power of the four-screw steam turbines, 60,000; 4230 passengers and crew are provided for. There are forty-one watertight compartments in the double bottom, and eighty-four watertight compartments in the moulded structure of the ship above the double bottom, formed by transverse and longitudinal bulkheads and watertight decks. The transverse bulkheads have been carried up to an unusual height. The conditions are such that should the fore part of the ship for the first five compartments, or the after part of the ship for the six after compartments, or the five centre compartments, be open to the sea, the ship would still remain in a perfectly stable condition. To render possible the launching and navigation of the vessel to the sea, it has been necessary to widen and deepen the channel of the River Clyde, a work which will be of lasting benefit to navigation. The ship was launched successfully on Monday last.

IN the announcement of Canadian tide tables made in NATURE of March 27 (p. 95), it was implied that they are issued by the Government Printing Bureau at Ottawa, whereas, Mr. W. Bell Dawson writes to point out, they are merely printed there, and are prepared and issued under his direction from the office of the Tidal and Current Survey, Ottawa. It may here be mentioned that the Tide Tables are issued in two series, which refer to eastern Canada and the Pacific respectively, the tides of two oceans 3000 miles apart, on opposite coasts. The work of the Canadian Survey is thus very extended, and the limited staff which carries it on is beginning further investigation in Hudson Bay, an area much larger than the North Sea, and quite as complex in its tides.

OUR ASTRONOMICAL COLUMN.

THE SOLAR UNION AT BONN.—The fifth meeting of the International Union for Cooperation in Solar Research will be held in the Physical Institute of the Bonn University on July 31 next, and a preliminary programme for that occasion has now been circulated. On the evening of July 30 a reception will be held in the large hall of the reading and recreation society, and the mornings of July 31, August 1 and 2, and afternoons of the two former dates, will be devoted to the discussions. The afternoon and evening of August 2 and the whole day of August 3 will be taken up with a visit to Cologne, a reception being given in the hall of the Gürzenich at the invitation of the city of Cologne, and probable alternative excursions to (1) motor through the Eifel to the valley of the Mosel, and (2) tour in the Siebengebirge. August 4 and 5 will see the resumption of the meetings, and the afternoon of the latter date may be employed in a steamer trip on the Rhine. In addition to the above, Prof. Küstner will receive the members at the observatory on the afternoon or evening of August 1, Prof. Karl Hausmann invites them to visit the Technical High School at Aachen, and the Astrophysical Observatory at Potsdam invites members for August 11.

A CASE OF LARGE PARALLEL PROPER MOTION.—Dr. Ragnar Furuhjelm, of the Helsingfors Observatory, communicates to the *Astronomische Nachrichten* (No. 4642, p. 179) an instance he has found of two stars fairly wide apart having the same velocity and direction of proper motion. The stars in question are a double star, BD $+45^\circ$ 4408 and No. 12740 in Burnham's catalogue (8·3 m. and 8·3 m., $\alpha =$ 0h. 0m. 23s., $\delta = +45^\circ\ 15{\cdot}5'$, 1900·0), the proper motion of which was earlier known and measured, and a star of the magnitude 9·5 m., its distance from the above binary being about 5·5 minutes of arc. Dr. Furuhjelm gives in detail the measures he made of both these stars on several plates which he had taken at different times in that region, and deduces the value of $0{\cdot}9''$ for the proper motion of the system, and $327{\cdot}58''$ and $254^\circ\ 13{\cdot}7'$ for the distance and position angle of stars. Finally, he directs attention to another similar case of large parallel proper motion as is exhibited in the stars A Ophiuchi and 30 Scorpii, which are about $12{\cdot}2'$ apart, and undergo a proper motion of $1{\cdot}25''$. In this instance also one of the stars is a double with a distance of $4{\cdot}2''$. Such systems form important objects for study.

THE SOLAR ROTATION IN 1911.—In the March number of *The Astrophysical Journal* (vol. xxxvii., No. 2) Messrs. J. S. Plaskett and Ralph E. DeLury describe and give the results of their very thorough investigation relating to the spectroscopic determination of the solar rotation. The work was carried out at the Dominion Observatory at Ottawa, the observatory having undertaken this programme of work on the lines determined by the International Union for Cooperation in Solar Research. The instrumental equipment at the Ottawa Observatory is of first-rate quality, and is all that is needful for the research which has been so successfully brought to an issue. The communication in question is of considerable length, and the authors describe and discuss the difficulties met with as regards personalities in measurement, instrumental errors, &c. The chief conclusions to which they ultimately reached were that the values they deduced for the solar rotation could be represented by formulæ which were in exceedingly good agreement with those obtained by Dunér and Adams (1908), except for a small and nearly constant angular difference. The absolute velocity of the solar rotation seems to be uncertain by a small amount, amounting to 2 or 3 per cent., due, as they suggest, to personal differences in the habit of measurement of the rotational displacements on the plates. No systematic differences of velocity were found for different elements, although they discussed 3000 residuals from different lines and elements. It is of interest to give here the different formulæ for the rotation as deduced by the authors and previous investigators:—

	Angular velocity.
Dunér	$10{\cdot}60^\circ + 4{\cdot}21^\circ \cos^2 \phi$
Halm	$12{\cdot}03^\circ + 2{\cdot}50^\circ \cos^2 \phi$
Adams (1908)	$10{\cdot}57^\circ + 4{\cdot}04^\circ \cos^2 \phi$
Adams (mean)	$11{\cdot}04^\circ + 3{\cdot}50^\circ \cos^2 \phi$
Plaskett (1911) ...	$10{\cdot}32^\circ + 4{\cdot}05^\circ \cos^2 \phi$
DeLury (1911)	$10{\cdot}04^\circ + 4{\cdot}00^\circ \cos^2 \phi$